

SEQUENCE LISTING

<110> Han, Hui-Quan
Kwak, Keith

<120> Human E3 Alpha Ubiquitin Ligase Family

<130> 01017/35966C

<140> To be assigned
<141> Herewith

<150> US 09/724,126
<151> 2000-11-28

<150> US 60/187,911
<151> 1999-03-08

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<170> PatentIn Ver. 2.0

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| 25 30 35 | |
| ttc ttg cat cat ttg gca caa ttg gtg cca gaa att tac ttt gct gaa Phe Leu His His Leu Ala Gln Leu Val Pro Glu Ile Tyr Phe Ala Glu | 857 |
| 40 45 50 | |
| atg gac cca gac ttg gaa aag cag gag gaa agt gta caa atg tca ata Met Asp Pro Asp Leu Glu Lys Gln Glu Ser Val Gln Met Ser Ile | 905 |
| 55 60 65 70 | |
| ttc act cca ctg gaa tgg tac tta ttt gga gaa gat cca gat att tgc Phe Thr Pro Leu Glu Trp Tyr Leu Phe Gly Glu Asp Pro Asp Ile Cys | 953 |
| 75 80 85 | |
| tta gag aaa ttg aag cac agt gga gca ttt cag ctt tgt ggg agg gtt Leu Glu Lys Leu Lys His Ser Gly Ala Phe Gln Leu Cys Gly Arg Val | 1001 |
| 90 95 100 | |
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| cca aca tgt gta ctc tgt atg gac tgc ttc cag gac agt gtt cat aaa Pro Thr Cys Val Leu Cys Met Asp Cys Phe Gln Asp Ser Val His Lys | 1097 |
| 120 125 130 | |
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| 200 205 210 | |
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| 215 220 225 230 | |
| ttc aat gat gaa cac cat tca tat gac cac gtc ata tac agc cta caa Phe Asn Asp Glu His His Ser Tyr Asp His Val Ile Tyr Ser Leu Gln | 1433 |
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| 265 270 275 | |

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| caa cat cca ctt cat gta gaa gta tta cac tca gag att atg gct cat Gln His Pro Leu His Val Glu Val Leu His Ser Glu Ile Met Ala His 295 300 305 310 | 1625 |
| cag aaa ttt gct ttg cgt ctt ggt tcc tgg atg aac aaa att atg agc Gln Lys Phe Ala Leu Arg Leu Gly Ser Trp Met Asn Lys Ile Met Ser 315 320 325 | 1673 |
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| gat gca aag ctt tat aaa ggt gcc cgt aag atc ctt cat gaa ttg atc Asp Ala Lys Leu Tyr Lys Gly Ala Arg Lys Ile Leu His Glu Leu Ile 360 365 370 | 1817 |
| ttc agc agt ttt ttt atg gag atg gaa tac aaa aaa ctc ttt gct atg Phe Ser Ser Phe Phe Met Glu Met Glu Tyr Lys Lys Leu Phe Ala Met 375 380 385 390 | 1865 |
| gaa ttt gtg aag tat tat aaa caa ctg cag aaa gaa tat atc agt gat Glu Phe Val Lys Tyr Tyr Lys Gln Leu Gln Lys Glu Tyr Ile Ser Asp 395 400 405 | 1913 |
| gat cat gac aga agt atc tct ata act gca ctt tca gtt cag atg ttt Asp His Asp Arg Ser Ile Ser Ile Thr Ala Leu Ser Val Gln Met Phe 410 415 420 | 1961 |
| act gtt cct act ctg gct cga cat ctt att gaa gag cag aat gtt atc Thr Val Pro Thr Leu Ala Arg His Leu Ile Glu Glu Gln Asn Val Ile 425 430 435 | 2009 |
| tct gtc att act gaa act ctg cta gaa gtt tta cct gag tac ttg gac Ser Val Ile Thr Glu Thr Leu Leu Glu Val Leu Pro Glu Tyr Leu Asp 440 445 450 | 2057 |
| agg aac aat aaa ttc aac ttc cag ggt tat agc cag gac aaa ttg gga Arg Asn Asn Lys Phe Asn Phe Gln Gly Tyr Ser Gln Asp Lys Leu Gly 455 460 465 470 | 2105 |
| aga gta tat gca gta ata tgt gac cta aag tat atc ctg atc agc aaa Arg Val Tyr Ala Val Ile Cys Asp Leu Lys Tyr Ile Leu Ile Ser Lys 475 480 485 | 2153 |
| ccc aca ata tgg aca gaa aga tta aga atg cag ttc ctt gaa ggt ttt Pro Thr Ile Trp Thr Glu Arg Leu Arg Met Gln Phe Leu Glu Gly Phe 490 495 500 | 2201 |
| cga tct ttt ttg aag att ctt acc tgt atg cag gga atg gaa gaa atc Arg Ser Phe Leu Lys Ile Leu Thr Cys Met Gln Gly Met Glu Glu Ile 505 510 515 | 2249 |
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| gag tgg tgt gct tgt gat gaa gaa ctc tta ctt gtg gct tat aaa gaa Glu Trp Cys Ala Cys Asp Glu Glu Leu Leu Leu Val Ala Tyr Lys Glu 555 560 565 | 2393 |
| tgt cac aaa gct gtg atg agg tgc agt acc agt ttc ata tct agt agc Cys His Lys Ala Val Met Arg Cys Ser Thr Ser Phe Ile Ser Ser Ser 570 575 580 | 2441 |
| aag aca gta gta caa tcg tgt gga cat agt ttg gaa aca aag tcc tac Lys Thr Val Val Gln Ser Cys Gly His Ser Leu Glu Thr Lys Ser Tyr 585 590 595 | 2489 |
| aga gta tct gag gat ctt gta agc ata cat ctg cca ctc tct agg acc Arg Val Ser Glu Asp Leu Val Ser Ile His Leu Pro Leu Ser Arg Thr 600 605 610 | 2537 |
| ctt gct ggt ctt cat gta cgt tta agc agg ctg ggt gct gtt tca aga Leu Ala Gly Leu His Val Arg Leu Ser Arg Leu Gly Ala Val Ser Arg 615 620 625 630 | 2585 |
| ctg cat gaa ttt gtg tct ttt gag gac ttt caa gta gag gta cta gtg Leu His Glu Phe Val Ser Phe Glu Asp Phe Gln Val Glu Val Leu Val 635 640 645 | 2633 |
| gaa tat cct tta cgt tgt ctg gtg ttg gtt gcc cag gtt gtt gct gag Glu Tyr Pro Leu Arg Cys Leu Val Leu Val Ala Gln Val Val Ala Glu 650 655 660 | 2681 |
| atg tgg cga aga aat gga ctg tct ctt att agc cag gtg ttt tat tac Met Trp Arg Arg Asn Gly Leu Ser Leu Ile Ser Gln Val Phe Tyr Tyr 665 670 675 | 2729 |
| caa gat gtt aag tgc aga gaa atg tat gat aaa gat atc atc atg Gln Asp Val Lys Cys Arg Glu Met Tyr Asp Lys Asp Ile Ile Met 680 685 690 | 2777 |
| ctt cag att ggt gca tct tta atg gat ccc aat aag ttc ttg tta ctg Leu Gln Ile Gly Ala Ser Leu Met Asp Pro Asn Lys Phe Leu Leu Leu 695 700 705 710 | 2825 |
| gta ctt cag agg tat gaa ctt gcc gag gct ttt aac aag acc ata tct Val Leu Gln Arg Tyr Glu Leu Ala Glu Ala Phe Asn Lys Thr Ile Ser 715 720 725 | 2873 |
| aca aaa gac cag gat ttg att aaa caa tat aat aca cta ata gaa gaa Thr Lys Asp Gln Asp Leu Ile Lys Gln Tyr Asn Thr Leu Ile Glu Glu 730 735 740 | 2921 |
| atg ctt cag gtc ctc atc tat att gtg ggt gag cgt tat gta cct gga Met Leu Gln Val Leu Ile Tyr Ile Val Gly Glu Arg Tyr Val Pro Gly 745 750 755 | 2969 |
| gtg gga aat gtg acc aaa gaa gag gtc aca atg aga gaa atc att cac Val Gly Asn Val Thr Lys Glu Glu Val Thr Met Arg Glu Ile Ile His 760 765 770 | 3017 |
| ttg ctt tgc att gaa ccc atg cca cac agt gcc att gcc aaa aat tta Leu Leu Cys Ile Glu Pro Met Pro His Ser Ala Ile Ala Lys Asn Leu 775 780 785 790 | 3065 |

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| gtg gcc aca ttt aag aaa cca ggt gta tca ggc cat gga gtt tat gaa Val Ala Thr Phe Lys Lys Pro Gly Val Ser Gly His Gly Val Tyr Glu 810 815 820 | 3161 |
| cta aaa gat gaa tca ctg aaa gac ttc aat atg tac ttt tat cat tac Leu Lys Asp Glu Ser Leu Lys Asp Phe Asn Met Tyr Phe Tyr His Tyr 825 830 835 | 3209 |
| tcc aaa acc cag cat agc aag gct gaa cat atg cag aag aaa agg aga Ser Lys Thr Gln His Ser Lys Ala Glu His Met Gln Lys Lys Arg Arg 840 845 850 | 3257 |
| aaa caa gaa aac aaa gat gaa gca ttg ccg cca cca cct cct gaa Lys Gln Glu Asn Lys Asp Glu Ala Leu Pro Pro Pro Pro Pro Glu 855 860 865 870 | 3305 |
| ttc tgc cct gct ttc agc aaa gtg att aac ctt ctc aac tgt gat atc Phe Cys Pro Ala Phe Ser Lys Val Ile Asn Leu Leu Asn Cys Asp Ile 875 880 885 | 3353 |
| atg atg tac att ctc agg acc gta ttt gag cggt gca ata gac aca gat Met Met Tyr Ile Leu Arg Thr Val Phe Glu Arg Ala Ile Asp Thr Asp 890 895 900 | 3401 |
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| tca gcc atg aat ata caa atg ctt ttg gaa aaa ctc aaa gga att ccc Ser Ala Met Asn Ile Gln Met Leu Leu Glu Lys Leu Lys Gly Ile Pro 955 960 965 | 3593 |
| cag tta gaa ggc cag aag gac atg ata acg tgg ata ctt cag atg ttt Gln Leu Glu Gly Gln Lys Asp Met Ile Thr Trp Ile Leu Gln Met Phe 970 975 980 | 3641 |
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| aca tca gga tcg gaa tct att aag aat gat gag att act cat gat aaa Thr Ser Gly Ser Glu Ser Ile Lys Asn Asp Glu Ile Thr His Asp Lys 1000 1005 1010 | 3737 |
| gaa aaa gca gaa cga aaa aga aaa gct gaa gct gct agg cta cat cgc Glu Lys Ala Glu Arg Lys Arg Lys Ala Glu Ala Ala Arg Leu His Arg 1015 1020 1025 1030 | 3785 |
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| Thr His Lys Leu Met Tyr Asp Asn Thr Ser Glu Met Pro Gly Lys Glu | | |
| 1050 1055 1060 | | |
| gat tcc att atg gag gaa gag agc acc cca gca gtc agt gac tac tct | | 3929 |
| Asp Ser Ile Met Glu Glu Ser Thr Pro Ala Val Ser Asp Tyr Ser | | |
| 1065 1070 1075 | | |
| aga att gct ttg ggt cct aaa cg ggt cca tct gtt act gaa aag gag | | 3977 |
| Arg Ile Ala Leu Gly Pro Lys Arg Gly Pro Ser Val Thr Glu Lys Glu | | |
| 1080 1085 1090 | | |
| gtg ctg acg tgc atc ctt tgc caa gaa gaa cag gag gtg aaa ata gaa | | 4025 |
| Val Leu Thr Cys Ile Leu Cys Gln Glu Gln Glu Val Lys Ile Glu | | |
| 1095 1100 1105 1110 | | |
| aat aat gcc atg gta tta tcg gcc tgt gtc cag aaa tct act gcc tta | | 4073 |
| Asn Asn Ala Met Val Leu Ser Ala Cys Val Gln Lys Ser Thr Ala Leu | | |
| 1115 1120 1125 | | |
| acc cag cac agg gga aaa ccc ata gaa ctc tca gga gaa gcc cta gac | | 4121 |
| Thr Gln His Arg Gly Lys Pro Ile Glu Leu Ser Gly Glu Ala Leu Asp | | |
| 1130 1135 1140 | | |
| cca ctt ttc atg gat cca gac ttg gca tat gga act tat aca gga agc | | 4169 |
| Pro Leu Phe Met Asp Pro Asp Leu Ala Tyr Gly Thr Tyr Thr Gly Ser | | |
| 1145 1150 1155 | | |
| tgt ggt cat gta atg cac gca gtg tgc tgg cag aag tat ttt gaa gct | | 4217 |
| Cys Gly His Val Met His Ala Val Cys Trp Gln Lys Tyr Phe Glu Ala | | |
| 1160 1165 1170 | | |
| gta cag ctg agc tct cag cag cgc att cat gtt gac ctt ttt gac ttg | | 4265 |
| Val Gln Leu Ser Ser Gln Gln Arg Ile His Val Asp Leu Phe Asp Leu | | |
| 1175 1180 1185 1190 | | |
| gaa agt gga gaa tat ctt tgc cct ctt tgc aaa tct ctg tgc aat act | | 4313 |
| Glu Ser Gly Glu Tyr Leu Cys Pro Leu Cys Lys Ser Leu Cys Asn Thr | | |
| 1195 1200 1205 | | |
| gtg atc ccc att att cct ttg caa cct caa aag ata aac agt gag aat | | 4361 |
| Val Ile Pro Ile Ile Pro Leu Gln Pro Gln Lys Ile Asn Ser Glu Asn | | |
| 1210 1215 1220 | | |
| gca gat gct ctt gct caa ctt ttg acc ctg gca cgg tgg ata cag act | | 4409 |
| Ala Asp Ala Leu Ala Gln Leu Leu Thr Leu Ala Arg Trp Ile Gln Thr | | |
| 1225 1230 1235 | | |
| gtt ctg gcc aga ata tca ggt tat aat ata aga cat gct aaa gga gaa | | 4457 |
| Val Leu Ala Arg Ile Ser Gly Tyr Asn Ile Arg His Ala Lys Gly Glu | | |
| 1240 1245 1250 | | |
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| Asn Pro Ile Pro Ile Phe Phe Asn Gln Gly Met Gly Asp Ser Thr Leu | | |
| 1255 1260 1265 1270 | | |
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| Glu Phe His Ser Ile Leu Ser Phe Gly Val Glu Ser Ser Ile Lys Tyr | | |
| 1275 1280 1285 | | |
| tca aat agc atc aag gaa atg gtt att ctc ttt gcc aca aca att tat | | 4601 |
| Ser Asn Ser Ile Lys Glu Met Val Ile Leu Phe Ala Thr Thr Ile Tyr | | |
| 1290 1295 1300 | | |

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| atg ctg acc tgg agc acc tgc gct ttc act atc cag gca att gaa aat Met Leu Thr Trp Ser Thr Cys Ala Phe Thr Ile Gln Ala Ile Glu Asn | 1320 1325 1330 | 4697 |
| cta ttg gga gat gaa gga aaa cct ctg ttt gga gca ctt caa aat agg Leu Leu Gly Asp Glu Gly Lys Pro Leu Phe Gly Ala Leu Gln Asn Arg | 1335 1340 1345 1350 | 4745 |
| cag cat aat ggt ctg aaa gca tta atg cag ttt gca gtt gca cag agg Gln His Asn Gly Leu Lys Ala Leu Met Gln Phe Ala Val Ala Gln Arg | 1355 1360 1365 | 4793 |
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| tca gtt gtt ctt cct aac ata aaa tca gaa gat aca cca tgc ctt ctg Ser Val Val Leu Pro Asn Ile Lys Ser Glu Asp Thr Pro Cys Leu Leu | 1385 1390 1395 | 4889 |
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| tcc ttg tat tgg gat gac cct gtt gat ctg cag cct tct tca gtt agt Ser Leu Tyr Trp Asp Asp Pro Val Asp Leu Gln Pro Ser Ser Val Ser | 1415 1420 1425 1430 | 4985 |
| tct tcc tat aac cac ctt tat ctc ttc cat ttg atc acc atg gca cac Ser Ser Tyr Asn His Leu Tyr Leu Phe His Leu Ile Thr Met Ala His | 1435 1440 1445 | 5033 |
| atg ctt cag ata cta ctt aca gta gac aca ggc cta ccc ctt gct cag Met Leu Gln Ile Leu Leu Thr Val Asp Thr Gly Leu Pro Leu Ala Gln | 1450 1455 1460 | 5081 |
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| tgg tat ttg tgg gtc tca ctg aag aat ggc atc acc cct tat ctt cgc Trp Tyr Leu Trp Val Ser Leu Lys Asn Gly Ile Thr Pro Tyr Leu Arg | 1495 1500 1505 1510 | 5225 |
| tgt gct gca ttg ttt ttc cac tat tta ctt ggg gta act ccq cct gag Cys Ala Ala Leu Phe Phe His Tyr Leu Leu Gly Val Thr Pro Pro Glu | 1515 1520 1525 | 5273 |
| gaa ctg cat acc aat tct gca gaa gga gag tac agt gca ctc tgt agc Glu Leu His Thr Asn Ser Ala Glu Gly Glu Tyr Ser Ala Leu Cys Ser | 1530 1535 1540 | 5321 |
| tat cta tct tta cct aca aat ttg ttc ctg ctc ttc cag gaa tat ttg Tyr Leu Ser Leu Pro Thr Asn Leu Phe Leu Leu Phe Gln Glu Tyr Trp | 1545 1550 1555 | 5369 |

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| gat act gta agg ccc ttg ctc cag agg tgg tgt gca gat cct gcc tta | 5417 |
| Asp Thr Val Arg Pro Leu Leu Gln Arg Trp Cys Ala Asp Pro Ala Leu | |
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| cta aac tgt ttg aag caa aaa aac acc gtg gtc agg tac cct aga aaa | 5465 |
| Leu Asn Cys Leu Lys Gln Lys Asn Thr Val Val Arg Tyr Pro Arg Lys | |
| 1575 1580 1585 1590 | |
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| 1595 1600 1605 | |
| caa gct tct cat ttc agg tgc cca cgg tct gca gat gat gag cga aag | 5561 |
| Gln Ala Ser His Phe Arg Cys Pro Arg Ser Ala Asp Asp Glu Arg Lys | |
| 1610 1615 1620 | |
| cat cct gtc ctc tgc ctt ttc tgt ggg gct ata cta tgt tct cag aac | 5609 |
| His Pro Val Leu Cys Leu Phe Cys Gly Ala Ile Leu Cys Ser Gln Asn | |
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| att tgc tgc cag gaa att gtg aac ggg gaa gag gtt gga gct tgc att | 5657 |
| Ile Cys Cys Gln Glu Ile Val Asn Gly Glu Val Gly Ala Cys Ile | |
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| ttt cac gca ctt cac tgt gga gcc gga gtc tgc att ttc cta aaa atc | 5705 |
| Phe His Ala Leu His Cys Gly Ala Gly Val Cys Ile Phe Leu Lys Ile | |
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| Tyr Pro Ala Pro Tyr Leu Asp Glu Tyr Gly Glu Thr Asp Pro Gly Leu | |
| 1690 1695 1700 | |
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| Lys Arg Gly Asn Pro Leu His Leu Ser Arg Glu Arg Tyr Arg Lys Leu | |
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| His Leu Val Trp Gln Gln His Cys Ile Ile Glu Glu Ile Ala Arg Ser | |
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Gln Leu Cys Gly Arg Val Phe Lys Ser Gly Glu Thr Thr Tyr Ser Cys
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Arg Asp Cys Ala Ile Asp Pro Thr Cys Val Leu Cys Met Asp Cys Phe
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Gly Gly Gly Phe Cys Asp Cys Gly Asp Thr Glu Ala Trp Lys Thr Gly
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Pro Phe Cys Val Asn His Glu Pro Gly Arg Ala Gly Thr Ile Lys Glu
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Asn Ser Arg Cys Pro Leu Asn Glu Glu Val Ile Val Gln Ala Arg Lys
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Ile Phe Pro Ser Val Ile Lys Tyr Val Val Glu Met Thr Ile Trp Glu
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Arg Tyr Tyr Cys Val Leu Phe Asn Asp Glu His His Ser Tyr Asp His
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Gln Leu His Thr Thr Ala Ile Asp Lys Glu Gly Arg Arg Ala Val Lys
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Ala Gly Ala Tyr Ala Ala Cys Gln Glu Ala Lys Glu Asp Ile Lys Ser
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His Ser Glu Asn Val Ser Gln His Pro Leu His Val Glu Val Leu His
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Lys Ala Arg Gly Cys Ala Tyr Pro Ala Pro Tyr Leu Asp Glu Tyr Gly
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Glu Cys Ser Ala Glu Glu Ile Ala Gly Lys Trp Leu Gln Ala Thr Asp
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Leu Thr Arg Glu Val Tyr Gln His Leu Ala His Tyr Val Pro Lys Ile
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Tyr Cys Arg Gly Pro Asn Pro Phe Pro Gln Lys Glu Asp Met Leu Ala
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Gln His Val Leu Leu Gly Pro Met Glu Trp Tyr Leu Cys Gly Glu Asp
70 75 80

| | |
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| tct att gtc gca cat cag aat ttt ggt ttg aaa ctt ttg tct tgg ctg Ser Ile Val Ala His Gln Asn Phe Gly Leu Lys Leu Leu Ser Trp Leu 310 315 320 | 1257 |
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| aga ctg atg ctt agt gat tcc aaa tta tgg aaa ggt gct agg agt gta Arg Leu Met Leu Ser Asp Ser Lys Leu Trp Lys Gly Ala Arg Ser Val 355 360 365 | | | 1401 |
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| cag aag ttc cta gaa ggg ttt gat gcc ttt ttg gaa tta cta aaa tgt Gln Lys Phe Leu Glu Gly Phe Asp Ala Phe Leu Glu Leu Leu Lys Cys 500 505 510 | | | 1833 |
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| tta atc gaa gct tac aag aaa tgt ctc gct gta ctg atg cag tgt cat Leu Ile Glu Ala Tyr Lys Lys Cys Leu Ala Val Leu Met Gln Cys His 565 570 575 | | | 2025 |
| ggt ggt tat act gat ggt gaa cag cca atc aca cta agc att tgt gga | | | 2073 |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Gly | Gly | Tyr | Thr | Asp | Gly | Glu | Gln | Pro | Ile | Thr | Leu | Ser | Ile | Cys | Gly | |
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| cat | tca | gtg | gaa | act | atc | aga | tac | tgt | gtt | tcc | caa | gaa | aaa | gtt | agc | 2121 |
| His | Ser | Val | Glu | Thr | Ile | Arg | Tyr | Cys | Val | Ser | Gln | Glu | Lys | Val | Ser | |
| 595 | | | | | 600 | | | | | | 605 | | | | | |
| att | cac | ctc | cca | gtt | tct | cgc | tta | ctt | gca | ggt | tta | cat | gta | tta | tta | 2169 |
| Ile | His | Leu | Pro | Val | Ser | Arg | Leu | Leu | Ala | Gly | Leu | His | Val | Leu | Leu | |
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| agc | aaa | agt | gaa | gtg | gca | tat | aaa | ttt | cca | gag | ctc | cta | cct | cta | agt | 2217 |
| Ser | Lys | Ser | Glu | Val | Ala | Tyr | Lys | Phe | Pro | Glu | Leu | Leu | Pro | Leu | Ser | |
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| gaa | ctt | agc | cca | ccc | atg | ttg | ata | gaa | cac | cct | ctt | aga | tgt | ctt | gtt | 2265 |
| Glu | Leu | Ser | Pro | Pro | Met | Leu | Ile | Glu | His | Pro | Leu | Arg | Cys | Leu | Val | |
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| ctg | tgt | gcc | caa | gta | cat | gcc | gga | atg | tgg | aga | aga | aat | ggg | ttc | tct | 2313 |
| Leu | Cys | Ala | Gln | Val | His | Ala | Gly | Met | Trp | Arg | Arg | Asn | Gly | Phe | Ser | |
| | | | | | 660 | | | 665 | | | 670 | | | | | |
| cta | gtt | aac | cag | att | tat | tac | tac | cat | aat | gtg | aaa | tgc | aga | cgt | gag | 2361 |
| Leu | Val | Asn | Gln | Ile | Tyr | Tyr | Tyr | His | Asn | Val | Lys | Cys | Arg | Arg | Glu | |
| | | | | | 675 | | | 680 | | | 685 | | | | | |
| atg | ttt | gac | aag | gat | gta | gta | atg | ctt | cag | aca | ggt | gtc | tcc | atg | atg | 2409 |
| Met | Phe | Asp | Lys | Asp | Val | Val | Met | Leu | Gln | Thr | Gly | Val | Ser | Met | Met | |
| | | | | | 690 | | | 695 | | | 700 | | | 705 | | |
| gat | cca | aat | cat | ttc | ctg | atg | atc | atg | ctc | agc | cgc | ttt | gaa | ctt | tat | 2457 |
| Asp | Pro | Asn | His | Phe | Leu | Met | Ile | Met | Leu | Ser | Arg | Phe | Glu | Leu | Tyr | |
| | | | | | 710 | | | | 715 | | | 720 | | | | |
| cag | att | ttc | agt | act | cca | gac | tat | gga | aaa | aga | ttt | agt | tct | gag | att | 2505 |
| Gln | Ile | Phe | Ser | Thr | Pro | Asp | Tyr | Gly | Lys | Arg | Phe | Ser | Ser | Glu | Ile | |
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| Thr | His | Lys | Asp | Val | Val | Gln | Gln | Asn | Asn | Thr | Leu | Ile | Glu | Glu | Met | |
| | | | | | 740 | | | 745 | | | 750 | | | | | |
| cta | tac | ctc | att | ata | atg | ctt | gtt | gga | gag | aga | ttt | agt | cct | gga | gtt | 2601 |
| Leu | Tyr | Leu | Ile | Ile | Met | Leu | Val | Gly | Glu | Arg | Phe | Ser | Pro | Gly | Val | |
| | | | | | 755 | | | 760 | | | 765 | | | | | |
| gga | cag | gta | aat | gct | aca | gat | gaa | atc | aag | cga | gag | att | atc | cat | cag | 2649 |
| Gly | Gln | Val | Asn | Ala | Thr | Asp | Glu | Ile | Lys | Arg | Glu | Ile | Ile | His | Gln | |
| | | | | | 770 | | | 775 | | | 780 | | | 785 | | |
| ttg | agt | atc | aag | cct | atg | gct | cat | agt | gaa | ttg | gta | aag | tct | tta | cct | 2697 |
| Leu | Ser | Ile | Lys | Pro | Met | Ala | His | Ser | Glu | Leu | Val | Lys | Ser | Leu | Pro | |
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| | | | | | 805 | | | 810 | | | 815 | | | | | |
| gcc | cat | ttc | aag | aaa | cct | gga | tta | aca | gga | cga | ggc | atg | tat | gaa | ctg | 2793 |
| Ala | His | Phe | Lys | Lys | Pro | Gly | Leu | Thr | Gly | Arg | Gly | Met | Tyr | Glu | Leu | |
| | | | | | 820 | | | 825 | | | 830 | | | | | |

| | | | | |
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| agg gca gaa cag tcc aag gca gaa gaa gcg caa ccg aaa ttg aaa aga Arg Ala Glu Gln Ser Lys Ala Glu Glu Ala Gln Arg Lys Leu Lys Arg 850 | 855 | 860 | 865 | 2889 |
| caa aat aga gaa gat aca gca ctc cca cct ccg gtg ttg cct cca ttc Gln Asn Arg Glu Asp Thr Ala Leu Pro Pro Pro Val Leu Pro Pro Phe 870 | 875 | 880 | 2937 | |
| tgc cct ctg ttt gca agc ctg gtt aac att ttg cag tca gat gtc atg Cys Pro Leu Phe Ala Ser Leu Val Asn Ile Leu Gln Ser Asp Val Met 885 | 890 | 895 | 2985 | |
| ttg tgc atc atg gga aca att ctg caa tgg gct gtg gaa cat aat gga Leu Cys Ile Met Gly Thr Ile Leu Gln Trp Ala Val Glu His Asn Gly 900 | 905 | 910 | 3033 | |
| tat gcc tgg tca gag tcc atg ctg caa agg gtg tta cat tta att ggc Tyr Ala Trp Ser Glu Ser Met Leu Gln Arg Val Leu His Leu Ile Gly 915 | 920 | 925 | 3081 | |
| atg gca cta caa gaa aaa caa cat tta gag aat gtc acg gaa gag Met Ala Leu Gln Glu Lys Gln His Leu Glu Asn Val Thr Glu Glu 930 | 935 | 940 | 945 | 3129 |
| cat gta gta aca ttt acc ttc act cag aag ata tca aaa cct ggt gaa His Val Val Thr Phe Thr Gln Lys Ile Ser Lys Pro Gly Glu 950 | 955 | 960 | 3177 | |
| gcg cca aaa aat tct cct agc ata cta gct atg ctg gaa aca cta caa Ala Pro Lys Asn Ser Pro Ser Ile Leu Ala Met Leu Glu Thr Leu Gln 965 | 970 | 975 | 3225 | |
| aat gct ccc tac cta gaa gtc cac aaa gac atg att cggttggata ttg Asn Ala Pro Tyr Leu Glu Val His Lys Asp Met Ile Arg Trp Ile Leu 980 | 985 | 990 | 3273 | |
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| ccc gtg gca gag aca gaa gga acc ata atg gaa gag agt tca agg gac Pro Val Ala Glu Thr Glu Gly Thr Ile Met Glu Glu Ser Ser Arg Asp 1010 | 1015 | 1020 | 1025 | 3369 |
| aaa gac aaa gct gag agg aag aga aaa gca gag att gcc aga ctg cgc Lys Asp Lys Ala Glu Arg Lys Arg Lys Ala Glu Ile Ala Arg Leu Arg 1030 | 1035 | 1040 | 3417 | |
| aga gaa aag atc atg gct cag atg tct gaa atg cag ccg cat ttt att Arg Glu Lys Ile Met Ala Gln Met Ser Glu Met Gln Arg His Phe Ile 1045 | 1050 | 1055 | 3465 | |
| gat gaa aac aaa gaa ctc ttt cag cag aca tta gaa ctg gat gcc tca Asp Glu Asn Lys Glu Leu Phe Gln Gln Thr Leu Glu Leu Asp Ala Ser 1060 | 1065 | 1070 | 3513 | |
| acc tct gct gtt ctt gat cat agc cct gtg gct tca gat atg aca ctt Thr Ser Ala Val Leu Asp His Ser Pro Val Ala Ser Asp Met Thr Leu 1075 | 1080 | 1085 | 3561 | |

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| aca gca ctg ggt ccc aca caa act cag gtt cct gaa caa aga caa ttc Thr Ala Leu Gly Pro Thr Gln Thr Gln Val Pro Glu Gln Arg Gln Phe 1090 1095 1100 1105 | 3609 |
| gtt aca tgt ata ttg tgt caa gag gag caa gaa gtt aaa gtg gaa agc Val Thr Cys Ile Leu Cys Gln Glu Glu Gln Glu Val Lys Val Glu Ser 1110 1115 1120 | 3657 |
| agg gca atg gtc ttg gca gca ttt gtt cag aga tca act gta tta tca Arg Ala Met Val Leu Ala Ala Phe Val Gln Arg Ser Thr Val Leu Ser 1125 1130 1135 | 3705 |
| aaa aac aga agt aaa ttt att caa gat cca gaa aaa tat gat cca tta Lys Asn Arg Ser Lys Phe Ile Gln Asp Pro Glu Lys Tyr Asp Pro Leu 1140 1145 1150 | 3753 |
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| cac att atg cat gcc cat tgt tgg caa agg tat ttt gat tcc gtt caa His Ile Met His Ala His Cys Trp Gln Arg Tyr Phe Asp Ser Val Gln 1170 1175 1180 1185 | 3849 |
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| cag ctc cct gaa ggg ttc agg cct gat ttt cgt cct aag atc cct tat Gln Leu Pro Glu Gly Phe Arg Pro Asp Phe Arg Pro Lys Ile Pro Tyr 1285 1290 1295 | 4185 |
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| 1650 1655 1660 1665 | |
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| 1670 1675 1680 | |
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| 1685 1690 1695 | |
| ctt gat gac tat ggg gag acc gac cag gga ctc aga cgg gga aat cct Leu Asp Asp Tyr Gly Glu Thr Asp Gln Gly Leu Arg Arg Gly Asn Pro | 5433 |
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| 1730 1735 1740 1745 | |
| aca ctg gtt ggc att gac tgg caa cat tta taattattgc accaccaaaa Thr Leu Val Gly Ile Asp Trp Gln His Leu | 5579 |
| 1750 1755 | |
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| gggagaaggt ggattcctgg tgcgtggct ggttttcag ggctgttaga ggttttttt | 6179 |
| ttctttttt ttatgttgc aagacttttgc gcttgagaa aactcactta gagggcttcc | 6239 |
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35 40 45
Ile Tyr Cys Arg Gly Pro Asn Pro Phe Pro Gln Lys Glu Asp Met Leu
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Ala Gln His Val Leu Leu Gly Pro Met Glu Trp Tyr Leu Cys Gly Glu
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Asp Pro Ala Phe Gly Phe Pro Lys Leu Glu Gln Ala Asn Lys Pro Ser
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His Leu Cys Gly Arg Val Phe Lys Val Gly Glu Pro Thr Tyr Ser Cys
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Arg Asp Cys Ala Val Asp Pro Thr Cys Val Leu Cys Met Glu Cys Phe
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Leu Gly Ser Ile His Arg Asp His Arg Tyr Arg Met Thr Thr Ser Gly
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Gly Gly Gly Phe Cys Asp Cys Gly Asp Thr Glu Ala Trp Lys Glu Gly
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Pro Tyr Cys Gln Lys His Glu Leu Asn Thr Ser Glu Ile Glu Glu Glu
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Glu Asp Pro Leu Val His Leu Ser Glu Asp Val Ile Ala Arg Thr Tyr
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Glu Lys Glu Ser Glu Leu Pro Ala Asp Leu Glu Met Val Glu Lys Ser
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Arg Tyr Gly Asp Phe Gln Tyr Cys Glu Gln Ala Lys Ser Val Ile Val
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| gga ttt cca aag ctc gag cag gca aac aag cct tct cac ctc tgt ggc Gly Phe Pro Lys Leu Glu Gln Ala Asn Lys Pro Ser His Leu Cys Gly | 1065 |
| 85 90 95 100 | |
| cga gtg ttt aaa gtg ggg gaa cct aca tac tcc tgc aga gac tgt gca Arg Val Phe Lys Val Gly Glu Pro Thr Tyr Ser Cys Arg Asp Cys Ala | 1113 |
| 105 110 115 | |
| gtt gac ccc acc tgt gtt tta tgc atg gag tgc ttc ctg gga agt atc Val Asp Pro Thr Cys Val Leu Cys Met Glu Cys Phe Leu Gly Ser Ile | 1161 |
| 120 125 130 | |
| cat aga gac cat cga tat agg atg acc aca tcg gga gga ggg ggc ttc His Arg Asp His Arg Tyr Arg Met Thr Thr Ser Gly Gly Gly Phe | 1209 |
| 135 140 145 | |
| tgt gac tgt ggt gac act gag gcg tgg aaa gag gga cct tac tgc cag Cys Asp Cys Gly Asp Thr Glu Ala Trp Lys Glu Gly Pro Tyr Cys Gln | 1257 |
| 150 155 160 | |
| aag cac aag ctc agc agc tct gaa gtt gtg gag gag gag gat cct ctt Lys His Lys Leu Ser Ser Glu Val Val Glu Glu Glu Asp Pro Leu | 1305 |
| 165 170 175 180 | |
| gtg cat cta tca gaa gat gtg atc gcc aga act tac aac att ttt gct Val His Leu Ser Glu Asp Val Ile Ala Arg Thr Tyr Asn Ile Phe Ala | 1353 |
| 185 190 195 | |
| att atg ttt cga tat gca gta gat ata ctg acc tgg gaa aaa gaa agt Ile Met Phe Arg Tyr Ala Val Asp Ile Leu Thr Trp Glu Lys Glu Ser | 1401 |
| 200 205 210 | |
| gaa ttg cct gaa gac tta gaa gtg gca gag aag agt gac acc tac tac Glu Leu Pro Glu Asp Leu Glu Val Ala Glu Lys Ser Asp Thr Tyr Tyr | 1449 |
| 215 220 225 | |
| tgc atg ctg ttt aat gat gag gtt cac acc tat gag caa gtc att tat Cys Met Leu Phe Asn Asp Glu Val His Thr Tyr Glu Gln Val Ile Tyr | 1497 |
| 230 235 240 | |
| acc ctt cag aaa gct gtg aac tgt aca cag aag gaa gcc att ggc ttt Thr Leu Gln Lys Ala Val Asn Cys Thr Gln Lys Glu Ala Ile Gly Phe | 1545 |

| 245 | 250 | 255 | 260 | |
|---|-----|-----|-----|------|
| gca act aca gtt gat cga gat ggc cgt agg cct gtc cga tat gga gat Ala Thr Thr Val Asp Arg Asp Gly Arg Arg Pro Val Arg Tyr Gly Asp 265 270 275 | | | | 1593 |
| ttc cag tac tgt gat caa gca aag aca gtc att gtg agg aac acc agc Phe Gln Tyr Cys Asp Gln Ala Lys Thr Val Ile Val Arg Asn Thr Ser 280 285 290 | | | | 1641 |
| aga cag acc aag ccg ctc aaa gtt caa gtt atg cac tcc tcc gtg gct Arg Gln Thr Lys Pro Leu Lys Val Gln Val Met His Ser Ser Val Ala 295 300 305 | | | | 1689 |
| gct cat cag aat ttt ggt ttg aaa gct ctg tcg tgg ctg gga agt gtt Ala His Gln Asn Phe Gly Leu Lys Ala Leu Ser Trp Leu Gly Ser Val 310 315 320 | | | | 1737 |
| att gga tac tca gat ggc ctt cgc agg att ttg tgt caa gtt gga tta Ile Gly Tyr Ser Asp Gly Leu Arg Arg Ile Leu Cys Gln Val Gly Leu 325 330 335 340 | | | | 1785 |
| caa gaa ggt cca gat ggc gaa aac tct tct ctg gtc gac aga ctg atg Gln Glu Gly Pro Asp Gly Glu Asn Ser Ser Leu Val Asp Arg Leu Met 345 350 355 | | | | 1833 |
| ctt aat gat tcc aaa tta tgg aaa ggg gct agg agt gtg tat cac cag Leu Asn Asp Ser Lys Leu Trp Lys Gly Ala Arg Ser Val Tyr His Gln 360 365 370 | | | | 1881 |
| ttg ttc atg agc agc ctg ctc atg gac ctc aag tat aag aag ctg ttc Leu Phe Met Ser Ser Leu Leu Met Asp Leu Lys Tyr Lys Lys Leu Phe 375 380 385 | | | | 1929 |
| gcg ctt cga ttt gct aaa aat tac cgg cag ttg cag agg gat ttt atg Ala Leu Arg Phe Ala Lys Asn Tyr Arg Gln Leu Gln Arg Asp Phe Met 390 395 400 | | | | 1977 |
| gag gat gat cac gag cgg gca gtg tcg gtg act gct ctg tct gtc cag Glu Asp Asp His Glu Arg Ala Val Ser Val Thr Ala Leu Ser Val Gln 405 410 415 420 | | | | 2025 |
| ttc ttc acc gca ccg acg ctg gcg cga atg ctc ctc aca gaa gag aac Phe Phe Thr Ala Pro Thr Leu Ala Arg Met Leu Leu Thr Glu Glu Asn 425 430 435 | | | | 2073 |
| ctg atg acc gtt atc att aag gct ttc atg gac cat ttg aaa cac aga Leu Met Thr Val Ile Ile Lys Ala Phe Met Asp His Leu Lys His Arg 440 445 450 | | | | 2121 |
| gat gcc cag ggc aga ttc cag ttt gaa cgc tac act gcc ctc caa gcc Asp Ala Gln Gly Arg Phe Gln Phe Glu Arg Tyr Thr Ala Leu Gln Ala 455 460 465 | | | | 2169 |
| ttc aag ttc agg aga gtc cag agc ctc atc tta gat ctc aag tat gta Phe Lys Phe Arg Arg Val Gln Ser Leu Ile Leu Asp Leu Lys Tyr Val 470 475 480 | | | | 2217 |
| ttg att agc aaa cca acg gag tgg tca gat gag ctg agg cag aag ttc Leu Ile Ser Lys Pro Thr Glu Trp Ser Asp Glu Leu Arg Gln Lys Phe 485 490 495 500 | | | | 2265 |
| tta caa ggg ttc gat gcc ttc ttg gaa tta ctg aag tgc atg cag gga | | | | 2313 |

| | | |
|---|-----|------|
| Leu Gln Gly Phe Asp Ala Phe Leu Glu Leu Leu Lys Cys Met Gln Gly | | |
| 505 | 510 | 515 |
| atg gac ccg atc acg cgt cag gtg gga cag cac att gag atg gag cca | | 2361 |
| Met Asp Pro Ile Thr Arg Gln Val Gly Gln His Ile Glu Met Glu Pro | | |
| 520 | 525 | 530 |
| gag tgg gaa gca gcc ttc aca ctg cag atg aag ctg aca cac gtc atc | | 2409 |
| Glu Trp Glu Ala Ala Phe Thr Leu Gln Met Lys Leu Thr His Val Ile | | |
| 535 | 540 | 545 |
| tca atg gtg cag gac tgg tgt gct ctg gac gaa aaa gtg tta att gaa | | 2457 |
| Ser Met Val Gln Asp Trp Cys Ala Leu Asp Glu Lys Val Leu Ile Glu | | |
| 550 | 555 | 560 |
| gct tac aag aaa tgc ctg gct gtg ctg aca cag tgt cat ggc gga ttt | | 2505 |
| Ala Tyr Lys Lys Cys Leu Ala Val Leu Thr Gln Cys His Gly Gly Phe | | |
| 565 | 570 | 575 |
| act gat ggt gaa cag cca atc aca ctc agt att tgt gga cac tcg gtg | | 2553 |
| Thr Asp Gly Glu Gln Pro Ile Thr Leu Ser Ile Cys Gly His Ser Val | | |
| 585 | 590 | 595 |
| gaa acc atc aga tac tgt gtt tcc caa gaa aaa gtt agc att cac ctc | | 2601 |
| Glu Thr Ile Arg Tyr Cys Val Ser Gln Glu Lys Val Ser Ile His Leu | | |
| 600 | 605 | 610 |
| cca att tct cgc ttg ctt gca ggt ttg cat gta ttg tta agc aaa agt | | 2649 |
| Pro Ile Ser Arg Leu Leu Ala Gly Leu His Val Leu Ser Lys Ser | | |
| 615 | 620 | 625 |
| gaa gtg gca tat aaa ttt cca gag ctc cta cct cta agt gaa ctg agc | | 2697 |
| Glu Val Ala Tyr Lys Phe Pro Glu Leu Leu Pro Leu Ser Glu Leu Ser | | |
| 630 | 635 | 640 |
| cca ccc atg ttg ata gaa cat cct ctt aga tgt ctt gtc tta tgt gct | | 2745 |
| Pro Pro Met Leu Ile Glu His Pro Leu Arg Cys Leu Val Leu Cys Ala | | |
| 645 | 650 | 655 |
| caa gtg cat gct ggg atg tgg aga aga aat ggc ttc tct cta gta aat | | 2793 |
| Gln Val His Ala Gly Met Trp Arg Arg Asn Gly Phe Ser Leu Val Asn | | |
| 665 | 670 | 675 |
| cag atc tat tac tac cat aat gtg aaa tgc agg cga gag atg ttc gac | | 2841 |
| Gln Ile Tyr Tyr His Asn Val Lys Cys Arg Arg Glu Met Phe Asp | | |
| 680 | 685 | 690 |
| aag gac ata gtg atg ctt cag aca ggt gtc tcc atg atg gac cca aac | | 2889 |
| Lys Asp Ile Val Met Leu Gln Thr Gly Val Ser Met Met Asp Pro Asn | | |
| 695 | 700 | 705 |
| cac ttc ctg atg atc atg ctc agc cgc ttt gaa ctc tat cag ctc ttc | | 2937 |
| His Phe Leu Met Ile Met Leu Ser Arg Phe Glu Leu Tyr Gln Leu Phe | | |
| 710 | 715 | 720 |
| agc acg cct gac tat ggg aag aga ttc agt tct gag gtt acc cat aag | | 2985 |
| Ser Thr Pro Asp Tyr Gly Lys Arg Phe Ser Ser Glu Val Thr His Lys | | |
| 725 | 730 | 735 |
| 740 | | |
| gac gtc gtt cag cag aac aac act ctg atc gaa gag atg ctc tac ctc | | 3033 |
| Asp Val Val Gln Gln Asn Asn Thr Leu Ile Glu Glu Met Leu Tyr Leu | | |
| 745 | 750 | 755 |

| | |
|---|------|
| atc atc atg ctt gtg gga gaa aga ttc aac cct ggg gtt gga cag gtg Ile Ile Met Leu Val Gly Glu Arg Phe Asn Pro Gly Val Gly Gln Val 760 765 770 | 3081 |
| gct gcc aca gat gaa atc aag agg gag att atc cat cag ttg agc atc Ala Ala Thr Asp Glu Ile Lys Arg Glu Ile Ile His Gln Leu Ser Ile 775 780 785 | 3129 |
| aag cct atg gct cac agt gag ctg gtg aag tct ctg cct gaa gat gag Lys Pro Met Ala His Ser Glu Leu Val Lys Ser Leu Pro Glu Asp Glu 790 795 800 | 3177 |
| aac aag gag acc ggc atg gag agc gtc atc gag tcc gtt gca cat ttc Asn Lys Glu Thr Gly Met Glu Ser Val Ile Glu Ser Val Ala His Phe 805 810 815 820 | 3225 |
| aag aaa cct ggg ctc aca ggg cga ggc atg tat gag ctg aag cca gag Lys Lys Pro Gly Leu Thr Gly Arg Gly Met Tyr Glu Leu Lys Pro Glu 825 830 835 | 3273 |
| tgt gcc aaa gag ttc aac ctg tat ttt tat cat ttc tcc agg gca gag Cys Ala Lys Glu Phe Asn Leu Tyr Phe Tyr His Phe Ser Arg Ala Glu 840 845 850 | 3321 |
| cag tcc aag gca gag gaa gct cag cgg aaa ttg aaa aga gaa aat aaa Gln Ser Lys Ala Glu Glu Ala Gln Arg Lys Leu Lys Arg Glu Asn Lys 855 860 865 | 3369 |
| gaa gat aca gca ctc cct cct ccg gct ttg cca ccg ttc tgc cct ttg Glu Asp Thr Ala Leu Pro Pro Pro Ala Leu Pro Pro Phe Cys Pro Leu 870 875 880 | 3417 |
| ttc gcg agt ctg gtt aac atc ttg cag tgt gac gtc atg ctg tac atc Phe Ala Ser Leu Val Asn Ile Leu Gln Cys Asp Val Met Leu Tyr Ile 885 890 895 900 | 3465 |
| atg gga acg atc ctg cag tgg gct gta gag cat cac ggg tct gcc tgg Met Gly Thr Ile Leu Gln Trp Ala Val Glu His His Gly Ser Ala Trp 905 910 915 | 3513 |
| tca gag tcc atg cta cag agg gtg ctg cat ttg atc ggg atg gct ctc Ser Glu Ser Met Leu Gln Arg Val Leu His Leu Ile Gly Met Ala Leu 920 925 930 | 3561 |
| cag gaa gag aag cac cac ttg gag aac gcc gtg gaa ggg cac gtg cag Gln Glu Lys His His Leu Glu Asn Ala Val Glu Gly His Val Gln 935 940 945 | 3609 |
| acc ttc acc ttc aca cag aag att tca aag cct ggt gat gca cca cat Thr Phe Thr Phe Thr Gln Lys Ile Ser Lys Pro Gly Asp Ala Pro His 950 955 960 | 3657 |
| aac tcc ccg agc atc cta gct atg ctg gag acc ttg cag aac gcc ccc Asn Ser Pro Ser Ile Leu Ala Met Leu Glu Thr Leu Gln Asn Ala Pro 965 970 975 980 | 3705 |
| tcc ctg gaa gcc cac aag gac atg atc agg tgg ttg cta aag atg ttt Ser Leu Glu Ala His Lys Asp Met Ile Arg Trp Leu Leu Lys Met Phe 985 990 995 | 3753 |
| aat gca att aag aag ata aga gag tgt tca tcc agc agc cct gtg gcc Asn Ala Ile Lys Lys Ile Arg Glu Cys Ser Ser Ser Ser Pro Val Ala 1000 1005 1010 | 3801 |

| | |
|---|------|
| gag gcg gag gga acc ata atg gag gag agc tca aga gac aag gac aaa Glu Ala Glu Gly Thr Ile Met Glu Glu Ser Ser Arg Asp Lys Asp Lys 1015 1020 1025 | 3849 |
| gca gag agg aaa aga aaa gcc gag atc gcc aga ctg cgc cg ^g gag aag Ala Glu Arg Lys Arg Lys Ala Glu Ile Ala Arg Leu Arg Arg Glu Lys 1030 1035 1040 | 3897 |
| atc atg gcc cag atg tct gag atg cag cg ^g cac ttc att gac gaa aac Ile Met Ala Gln Met Ser Glu Met Gln Arg His Phe Ile Asp Glu Asn 1045 1050 1055 1060 | 3945 |
| aaa gag ctc ttc cag cag acc cta gag ctg gac acc tct gcc tct gcc Lys Glu Leu Phe Gln Gln Thr Leu Glu Leu Asp Thr Ser Ala Ser Ala 1065 1070 1075 | 3993 |
| act ctt gac agc agc cct ccc gtt tca gac gca gct ctt aca gca ctg Thr Leu Asp Ser Ser Pro Pro Val Ser Asp Ala Ala Leu Thr Ala Leu 1080 1085 1090 | 4041 |
| ggc cca gca cag aca cag gtc cct gaa ccg aga cag ttt gtc acc tgt Gly Pro Ala Gln Thr Gln Val Pro Glu Pro Arg Gln Phe Val Thr Cys 1095 1100 1105 | 4089 |
| ata tta tgt caa gag gag caa gag gtg act gtg gga agc agg gcg atg Ile Leu Cys Gln Glu Gln Glu Val Thr Val Gly Ser Arg Ala Met 1110 1115 1120 | 4137 |
| gtc ttg gca gcg ttt gtt cag agg tca acg gtt ctg tca aaa gac agg Val Leu Ala Ala Phe Val Gln Arg Ser Thr Val Leu Ser Lys Asp Arg 1125 1130 1135 1140 | 4185 |
| acg aaa acc atc gcg gac cca gaa aaa tat gat cca tta ttc atg cac Thr Lys Thr Ile Ala Asp Pro Glu Lys Tyr Asp Pro Leu Phe Met His 1145 1150 1155 | 4233 |
| ccc gat ctg tct tgt ggg aca cac act ggc agc tgt ggg cac gtt atg Pro Asp Leu Ser Cys Gly Thr His Thr Gly Ser Cys Gly His Val Met 1160 1165 1170 | 4281 |
| cat gcc cat tgt tgg caa agg tat ttt gat tcc gtt caa gcc aag gag His Ala His Cys Trp Gln Arg Tyr Phe Asp Ser Val Gln Ala Lys Glu 1175 1180 1185 | 4329 |
| cag cga agg cag cag cg ^g ctg cgc ttg cac act agc tac gat gta gag Gln Arg Arg Gln Gln Arg Leu Arg Leu His Thr Ser Tyr Asp Val Glu 1190 1195 1200 | 4377 |
| aat ggc gag ttc ctc tgc cc ^g ctc tgt gag tgc ctg agc aac acg gtg Asn Gly Glu Phe Leu Cys Pro Leu Cys Glu Cys Leu Ser Asn Thr Val 1205 1210 1215 1220 | 4425 |
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| ttt tca gac caa cca gat ctg gca cag tgg acg aga gca gta aca cag Phe Ser Asp Gln Pro Asp Leu Ala Gln Trp Thr Arg Ala Val Thr Gln 1240 1245 1250 | 4521 |
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 Thr Ser Ser Glu Asp Thr Glu Ala Met Asn Ile Ile Pro Ile Pro
 1270 1275 1280

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 Glu Gly Phe Arg Pro Asp Phe Tyr Pro Arg Asn Pro Tyr Ser Asp Ser
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 Ile Lys Glu Met Leu Thr Thr Phe Gly Thr Ala Ala Tyr Lys Val Gly
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 Leu Lys Val His Pro Asn Glu Gly Asp Pro Arg Val Pro Ile Leu Cys
 1320 1325 1330

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 Trp Gly Thr Cys Ala Tyr Thr Ile Gln Ser Ile Glu Arg Ile Leu Ser
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 Asp Glu Lys Pro Val Phe Gly Pro Leu Pro Cys Arg Leu Asp Asp
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 tgt ctc agg tcg tta aca cgg ttt gca gca gca cat tgg aca gtg gcg 4905
 Cys Leu Arg Ser Leu Thr Arg Phe Ala Ala Ala His Trp Thr Val Ala
 1365 1370 1375 1380

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 1385 1390 1395

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 Val Pro Ser Asp Ser Tyr Glu Asp Leu Pro Cys Ile Leu Asp Ile Asp
 1400 1405 1410

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 Met Phe His Leu Leu Val Gly Leu Val Leu Ala Phe Pro Ala Leu Gln
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 Cys Gln Asp Phe Ser Gly Ser Ser Leu Ala Thr Gly Asp Leu His Ile
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 Phe His Leu Val Thr Met Ala His Ile Val Gln Ile Leu Leu Thr Ser
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 1465 1470 1475

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 Glu Leu Ala Ile Leu Ser Leu His Lys Thr Leu His Gln Tyr Thr Gly
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 1495 1500 1505

 cgg gcc gcc atc atg cct ttc ctc aag tgc tct gct ttg ttt ttc cac 5337
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 1510 1515 1520

| | |
|---|------|
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| att cac ctt ttt caa gaa aac agt gac atc atg aac tcc ctg att gaa Ile His Leu Phe Gln Glu Asn Ser Asp Ile Met Asn Ser Leu Ile Glu 1560 1565 1570 | 5481 |
| agt tgg tgc cag aac agt gaa gtt aaa cgg tat cta aat ggc gag aga Ser Trp Cys Gln Asn Ser Glu Val Lys Arg Tyr Leu Asn Gly Glu Arg 1575 1580 1585 | 5529 |
| gga gcg ata agc tac ccc aga gga gct aac aaa ctg ata gac ctt cca Gly Ala Ile Ser Tyr Pro Arg Gly Ala Asn Lys Leu Ile Asp Leu Pro 1590 1595 1600 | 5577 |
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| ggg gcc ggc atc ttc ctg aga gtg cgg gaa tgt cag gtg cta ttt tta Gly Ala Gly Ile Phe Leu Arg Val Arg Glu Cys Gln Val Leu Phe Leu 1670 1675 1680 | 5817 |
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| gagtttgta acacagctgg cttttccag | 6089 |

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Asp Leu Asn Arg Glu Val Tyr Gln His Leu Ala His Cys Val Pro Lys
 35 40 45

Ile Tyr Cys Arg Gly Pro Asn Pro Phe Pro Gln Lys Glu Asp Thr Leu
 50 55 60

Ala Gln His Ile Leu Leu Gly Pro Met Glu Trp Tyr Ile Cys Ala Glu
 65 70 75 80

Asp Pro Ala Leu Gly Phe Pro Lys Leu Glu Gln Ala Asn Lys Pro Ser
 85 90 95

His Leu Cys Gly Arg Val Phe Lys Val Gly Glu Pro Thr Tyr Ser Cys
 100 105 110

Arg Asp Cys Ala Val Asp Pro Thr Cys Val Leu Cys Met Glu Cys Phe
 115 120 125

Leu Gly Ser Ile His Arg Asp His Arg Tyr Arg Met Thr Thr Ser Gly
 130 135 140

Gly Gly Gly Phe Cys Asp Cys Gly Asp Thr Glu Ala Trp Lys Glu Gly
 145 150 155 160

Pro Tyr Cys Gln Lys His Lys Leu Ser Ser Ser Glu Val Val Glu Glu
 165 170 175

Glu Asp Pro Leu Val His Leu Ser Glu Asp Val Ile Ala Arg Thr Tyr
 180 185 190

Asn Ile Phe Ala Ile Met Phe Arg Tyr Ala Val Asp Ile Leu Thr Trp
 195 200 205

Glu Lys Glu Ser Glu Leu Pro Glu Asp Leu Glu Val Ala Glu Lys Ser
 210 215 220

Asp Thr Tyr Tyr Cys Met Leu Phe Asn Asp Glu Val His Thr Tyr Glu
 225 230 235 240

Gln Val Ile Tyr Thr Leu Gln Lys Ala Val Asn Cys Thr Gln Lys Glu
 245 250 255

Ala Ile Gly Phe Ala Thr Thr Val Asp Arg Asp Gly Arg Arg Pro Val
 260 265 270

Arg Tyr Gly Asp Phe Gln Tyr Cys Asp Gln Ala Lys Thr Val Ile Val
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Arg Asn Thr Ser Arg Gln Thr Lys Pro Leu Lys Val Gln Val Met His
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Ser Ser Val Ala Ala His Gln Asn Phe Gly Leu Lys Ala Leu Ser Trp
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 Asp Arg Leu Met Leu Asn Asp Ser Lys Leu Trp Lys Gly Ala Arg Ser
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 Lys Lys Leu Phe Ala Leu Arg Phe Ala Lys Asn Tyr Arg Gln Leu Gln
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 Arg Asp Phe Met Glu Asp Asp His Glu Arg Ala Val Ser Val Thr Ala
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 Thr His Val Ile Ser Met Val Gln Asp Trp Cys Ala Leu Asp Glu Lys
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 Ser Ile His Leu Pro Ile Ser Arg Leu Leu Ala Gly Leu His Val Leu
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 625 630 635 640

Ser Glu Leu Ser Pro Pro Met Leu Ile Glu His Pro Leu Arg Cys Leu
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 Val Leu Cys Ala Gln Val His Ala Gly Met Trp Arg Arg Asn Gly Phe
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 Ser Leu Val Asn Gln Ile Tyr Tyr His Asn Val Lys Cys Arg Arg
 675 680 685
 Glu Met Phe Asp Lys Asp Ile Val Met Leu Gln Thr Gly Val Ser Met
 690 695 700
 Met Asp Pro Asn His Phe Leu Met Ile Met Leu Ser Arg Phe Glu Leu
 705 710 715 720
 Tyr Gln Leu Phe Ser Thr Pro Asp Tyr Gly Lys Arg Phe Ser Ser Glu
 725 730 735
 Val Thr His Lys Asp Val Val Gln Gln Asn Asn Thr Leu Ile Glu Glu
 740 745 750
 Met Leu Tyr Leu Ile Ile Met Leu Val Gly Glu Arg Phe Asn Pro Gly
 755 760 765
 Val Gly Gln Val Ala Ala Thr Asp Glu Ile Lys Arg Glu Ile Ile His
 770 775 780
 Gln Leu Ser Ile Lys Pro Met Ala His Ser Glu Leu Val Lys Ser Leu
 785 790 795 800
 Pro Glu Asp Glu Asn Lys Glu Thr Gly Met Glu Ser Val Ile Glu Ser
 805 810 815
 Val Ala His Phe Lys Lys Pro Gly Leu Thr Gly Arg Gly Met Tyr Glu
 820 825 830
 Leu Lys Pro Glu Cys Ala Lys Glu Phe Asn Leu Tyr Phe Tyr His Phe
 835 840 845
 Ser Arg Ala Glu Gln Ser Lys Ala Glu Glu Ala Gln Arg Lys Leu Lys
 850 855 860
 Arg Glu Asn Lys Glu Asp Thr Ala Leu Pro Pro Pro Ala Leu Pro Pro
 865 870 875 880
 Phe Cys Pro Leu Phe Ala Ser Leu Val Asn Ile Leu Gln Cys Asp Val
 885 890 895
 Met Leu Tyr Ile Met Gly Thr Ile Leu Gln Trp Ala Val Glu His His
 900 905 910
 Gly Ser Ala Trp Ser Glu Ser Met Leu Gln Arg Val Leu His Leu Ile
 915 920 925
 Gly Met Ala Leu Gln Glu Glu Lys His His Leu Glu Asn Ala Val Glu
 930 935 940
 Gly His Val Gln Thr Phe Thr Phe Thr Gln Lys Ile Ser Lys Pro Gly
 945 950 955 960
 Asp Ala Pro His Asn Ser Pro Ser Ile Leu Ala Met Leu Glu Thr Leu
 965 970 975

Gln Asn Ala Pro Ser Leu Glu Ala His Lys Asp Met Ile Arg Trp Leu
 980 985 990
 Leu Lys Met Phe Asn Ala Ile Lys Lys Ile Arg Glu Cys Ser Ser Ser
 995 1000 1005
 Ser Pro Val Ala Glu Ala Glu Gly Thr Ile Met Glu Glu Ser Ser Arg
 1010 1015 1020
 Asp Lys Asp Lys Ala Glu Arg Lys Arg Lys Ala Glu Ile Ala Arg Leu
 025 1030 1035 1040
 Arg Arg Glu Lys Ile Met Ala Gln Met Ser Glu Met Gln Arg His Phe
 1045 1050 1055
 Ile Asp Glu Asn Lys Glu Leu Phe Gln Gln Thr Leu Glu Leu Asp Thr
 1060 1065 1070
 Ser Ala Ser Ala Thr Leu Asp Ser Ser Pro Pro Val Ser Asp Ala Ala
 1075 1080 1085
 Leu Thr Ala Leu Gly Pro Ala Gln Thr Gln Val Pro Glu Pro Arg Gln
 1090 1095 1100
 Phe Val Thr Cys Ile Leu Cys Gln Glu Glu Gln Glu Val Thr Val Gly
 105 1110 1115 1120
 Ser Arg Ala Met Val Leu Ala Ala Phe Val Gln Arg Ser Thr Val Leu
 1125 1130 1135
 Ser Lys Asp Arg Thr Lys Thr Ile Ala Asp Pro Glu Lys Tyr Asp Pro
 1140 1145 1150
 Leu Phe Met His Pro Asp Leu Ser Cys Gly Thr His Thr Gly Ser Cys
 1155 1160 1165
 Gly His Val Met His Ala His Cys Trp Gln Arg Tyr Phe Asp Ser Val
 1170 1175 1180
 Gln Ala Lys Glu Gln Arg Arg Gln Gln Arg Leu Arg Leu His Thr Ser
 185 1190 1195 1200
 Tyr Asp Val Glu Asn Gly Glu Phe Leu Cys Pro Leu Cys Glu Cys Leu
 1205 1210 1215
 Ser Asn Thr Val Ile Pro Leu Leu Pro Pro Arg Ser Ile Leu Ser
 1220 1225 1230
 Arg Arg Leu Asn Phe Ser Asp Gln Pro Asp Leu Ala Gln Trp Thr Arg
 1235 1240 1245
 Ala Val Thr Gln Gln Ile Lys Val Val Gln Met Leu Arg Arg Lys His
 1250 1255 1260
 Asn Ala Ala Asp Thr Ser Ser Ser Glu Asp Thr Glu Ala Met Asn Ile
 265 1270 1275 1280
 Ile Pro Ile Pro Glu Gly Phe Arg Pro Asp Phe Tyr Pro Arg Asn Pro
 1285 1290 1295
 Tyr Ser Asp Ser Ile Lys Glu Met Leu Thr Thr Phe Gly Thr Ala Ala
 1300 1305 1310

Tyr Lys Val Gly Leu Lys Val His Pro Asn Glu Gly Asp Pro Arg Val
 1315 1320 1325
 Pro Ile Leu Cys Trp Gly Thr Cys Ala Tyr Thr Ile Gln Ser Ile Glu
 1330 1335 1340
 Arg Ile Leu Ser Asp Glu Glu Lys Pro Val Phe Gly Pro Leu Pro Cys
 345 1350 1355 1360
 Arg Leu Asp Asp Cys Leu Arg Ser Leu Thr Arg Phe Ala Ala Ala His
 1365 1370 1375
 Trp Thr Val Ala Leu Leu Pro Val Val Gln Gly His Phe Cys Lys Leu
 1380 1385 1390
 Phe Ala Ser Leu Val Pro Ser Asp Ser Tyr Glu Asp Leu Pro Cys Ile
 1395 1400 1405
 Leu Asp Ile Asp Met Phe His Leu Leu Val Gly Leu Val Leu Ala Phe
 1410 1415 1420
 Pro Ala Leu Gln Cys Gln Asp Phe Ser Gly Ser Ser Leu Ala Thr Gly
 425 1430 1435 1440
 Asp Leu His Ile Phe His Leu Val Thr Met Ala His Ile Val Gln Ile
 1445 1450 1455
 Leu Leu Thr Ser Cys Thr Glu Glu Asn Gly Met Asp Gln Glu Asn Pro
 1460 1465 1470
 Thr Gly Glu Glu Glu Leu Ala Ile Leu Ser Leu His Lys Thr Leu His
 1475 1480 1485
 Gln Tyr Thr Gly Ser Ala Leu Lys Glu Ala Pro Ser Gly Trp His Leu
 1490 1495 1500
 Trp Arg Ser Val Arg Ala Ala Ile Met Pro Phe Leu Lys Cys Ser Ala
 505 1510 1515 1520
 Leu Phe Phe His Tyr Leu Asn Gly Val Pro Ala Pro Pro Asp Leu Gln
 1525 1530 1535
 Val Ser Gly Thr Ser His Phe Glu His Leu Cys Asn Tyr Leu Ser Leu
 1540 1545 1550
 Pro Thr Asn Leu Ile His Leu Phe Gln Glu Asn Ser Asp Ile Met Asn
 1555 1560 1565
 Ser Leu Ile Glu Ser Trp Cys Gln Asn Ser Glu Val Lys Arg Tyr Leu
 1570 1575 1580
 Asn Gly Glu Arg Gly Ala Ile Ser Tyr Pro Arg Gly Ala Asn Lys Leu
 585 1590 1595 1600
 Ile Asp Leu Pro Glu Asp Tyr Ser Ser Leu Ile Asn Gln Ala Ser Asn
 1605 1610 1615
 Phe Ser Cys Pro Lys Ser Gly Gly Asp Lys Ser Arg Ala Pro Thr Leu
 1620 1625 1630
 Cys Leu Val Cys Gly Ser Leu Leu Cys Ser Gln Ser Tyr Cys Cys Gln
 1635 1640 1645

Ala Glu Leu Glu Gly Glu Asp Val Gly Ala Cys Thr Ala His Thr Tyr
1650 1655 1660

Ser Cys Gly Ser Gly Ala Gly Ile Phe Leu Arg Val Arg Glu Cys Gln
665 1670 1675 1680

Val Leu Phe Leu Ala Gly Lys Thr Lys Gly Cys Phe Tyr Ser Pro Pro
1685 1690 1695

Tyr Leu Asp Asp Tyr Gly Glu Thr Asp Gln Gly Leu Arg Arg Gly Asn
1700 1705 1710

Pro Leu His Leu Cys Gln Glu Arg Phe Arg Lys Ile Gln Lys Leu Trp
1715 1720 1725

Gln Gln His Ser Ile Thr Glu Glu Ile Gly His Ala Gln Glu Ala Asn
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Gln Thr Leu Val Gly Ile Asp Trp Gln His Leu
745 1750 1755

<210> 7
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer
-2282-91

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ctgctcgagt ctgcgtcaaa c

21

<210> 8
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer -
2385-35

<400> 8
tctcgtatcg ttgcagccctt gcta

24

<210> 9
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer 2282-94

<400> 9
gtatgaacctt gccgaggctt tta

23

<210> 10
<211> 23
<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer 2294-37

<400> 10
caatacttccagccctca gaa 23

<210> 11
<211> 18
<212> DNA
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer 2380-88

<400> 11
atggcgtcgc tagagcca 18

<210> 12
<211> 23
<212> DNA
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer 2378-32

<400> 12
caaagcggct gagcatgatc atc 23

<210> 13
<211> 23
<212> DNA
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Primer 2381-48

<400> 13
tgaacagcca atcacactaa gca 23

<210> 14
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<212> DNA
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<220>

<223> Description of Artificial Sequence: Primer 2385-94

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<210> 15
<211> 1757
<212> PRT
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<400> 15

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Glu Pro Pro Leu Ala Pro Gln Arg Pro Ala Ser Trp Trp Asp Gln Gln
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Val Asp Phe Tyr Thr Ala Phe Leu His His Leu Ala Gln Leu Val Pro
 35 40 45

Glu Ile Tyr Phe Ala Glu Met Asp Pro Asp Leu Glu Lys Gln Glu Glu
 50 55 60

Ser Val Gln Met Ser Ile Leu Thr Pro Leu Glu Trp Tyr Leu Phe Gly
 65 70 75 80

Glu Asp Pro Asp Ile Cys Leu Glu Lys Leu Lys His Ser Gly Ala Phe
 85 90 95

Gln Leu Cys Gly Lys Val Phe Lys Ser Gly Glu Thr Thr Tyr Ser Cys
 100 105 110

Arg Asp Cys Ala Ile Asp Pro Thr Cys Val Leu Cys Met Asp Cys Phe
 115 120 125

Gln Ser Ser Val His Lys Asn His Arg Tyr Lys Met His Thr Ser Thr
 130 135 140

Gly Gly Gly Phe Cys Asp Cys Gly Asp Thr Glu Ala Trp Lys Thr Gly
 145 150 155 160

Pro Phe Cys Val Asp His Glu Pro Gly Arg Ala Gly Thr Thr Lys Glu
 165 170 175

Ser Leu His Cys Pro Leu Asn Glu Glu Val Ile Ala Gln Ala Arg Arg
 180 185 190

Ile Phe Pro Ser Val Ile Lys Tyr Ile Val Glu Met Thr Ile Trp Glu
 195 200 205

Glu Glu Lys Glu Leu Pro Pro Glu Leu Gln Ile Arg Glu Lys Asn Glu
 210 215 220

Arg Tyr Tyr Cys Val Leu Phe Asn Asp Glu His His Ser Tyr Asp His
 225 230 235 240

Val Ile Tyr Ser Leu Gln Arg Ala Leu Asp Cys Glu Leu Ala Glu Ala
 245 250 255

Gln Leu His Thr Thr Ala Ile Asp Lys Glu Gly Arg Arg Ala Val Lys
 260 265 270

Ala Gly Val Tyr Ala Thr Cys Gln Glu Ala Lys Glu Asp Ile Lys Ser
 275 280 285

His Ser Glu Asn Val Ser Gln His Pro Leu His Val Glu Val Leu His
 290 295 300

Ser Val Val Met Ala His Gln Lys Phe Ala Leu Arg Leu Gly Ser Trp
 305 310 315 320

Met Asn Lys Ile Met Ser Tyr Ser Ser Asp Phe Arg Gln Ile Phe Cys
 325 330 335

Gln Ala Cys Leu Val Glu Glu Pro Gly Ser Glu Asn Pro Cys Leu Ile
 340 345 350
 Ser Arg Leu Met Leu Trp Asp Ala Lys Leu Tyr Lys Gly Ala Arg Lys
 355 360 365
 Ile Leu His Glu Leu Ile Phe Ser Ser Phe Phe Met Glu Met Glu Tyr
 370 375 380
 Lys Lys Leu Phe Ala Met Glu Phe Val Lys Tyr Tyr Lys Gln Leu Gln
 385 390 395 400
 Lys Glu Tyr Ile Ser Asp Asp His Glu Arg Ser Ile Ser Ile Thr Ala
 405 410 415
 Leu Ser Val Gln Met Leu Thr Val Pro Thr Leu Ala Arg His Leu Ile
 420 425 430
 Glu Glu Gln Asn Val Ile Ser Val Ile Thr Glu Thr Leu Leu Glu Val
 435 440 445
 Leu Pro Glu Tyr Leu Asp Arg Asn Asn Lys Phe Asn Phe Gln Gly Tyr
 450 455 460
 Ser Gln Asp Lys Leu Gly Arg Val Tyr Ala Val Ile Cys Asp Leu Lys
 465 470 475 480
 Tyr Ile Leu Ile Ser Lys Pro Val Ile Trp Thr Glu Arg Leu Arg Ala
 485 490 495
 Gln Phe Leu Glu Gly Phe Arg Ser Phe Leu Lys Ile Leu Thr Cys Met
 500 505 510
 Gln Gly Met Glu Glu Ile Arg Arg Gln Val Gly Gln His Ile Glu Val
 515 520 525
 Asp Pro Asp Trp Glu Ala Ala Ile Ala Ile Gln Met Gln Leu Lys Asn
 530 535 540
 Ile Leu Leu Met Phe Gln Glu Trp Cys Ala Cys Asp Glu Asp Leu Leu
 545 550 555 560
 Leu Val Ala Tyr Lys Glu Cys His Lys Ala Val Met Arg Cys Ser Thr
 565 570 575
 Asn Phe Met Ser Ser Thr Lys Thr Val Val Gln Leu Cys Gly His Ser
 580 585 590
 Leu Glu Thr Lys Ser Tyr Lys Val Ser Glu Asp Leu Val Ser Ile His
 595 600 605
 Leu Pro Leu Ser Arg Thr Leu Ala Gly Leu His Val Arg Leu Ser Arg
 610 615 620
 Leu Gly Ala Ile Ser Arg Leu His Glu Phe Val Pro Phe Asp Ser Phe
 625 630 635 640
 Gln Val Glu Val Leu Val Glu Tyr Pro Leu Arg Cys Leu Val Leu Val
 645 650 655
 Ala Gln Val Val Ala Glu Met Trp Arg Arg Asn Gly Leu Ser Leu Ile
 660 665 670

Ser Gln Val Phe Tyr Tyr Gln Asp Val Lys Cys Arg Glu Glu Met Tyr
 675 680 685
 Asp Lys Asp Ile Ile Met Leu Gln Ile Gly Ala Ser Ile Met Asp Pro
 690 695 700
 Asn Lys Phe Leu Leu Leu Val Leu Gln Arg Tyr Glu Leu Thr Asp Ala
 705 710 715 720
 Phe Asn Lys Thr Ile Ser Thr Lys Asp Gln Asp Leu Ile Lys Gln Tyr
 725 730 735
 Asn Thr Leu Ile Glu Glu Met Leu Gln Val Leu Ile Tyr Ile Val Gly
 740 745 750
 Glu Arg Tyr Val Pro Gly Val Gly Asn Val Thr Arg Glu Glu Val Ile
 755 760 765
 Met Arg Glu Ile Thr His Leu Leu Cys Ile Glu Pro Met Pro His Ser
 770 775 780
 Ala Ile Ala Arg Asn Leu Pro Glu Asn Glu Asn Asn Glu Thr Gly Leu
 785 790 795 800
 Glu Asn Val Ile Asn Lys Val Ala Thr Phe Lys Lys Pro Gly Val Ser
 805 810 815
 Gly His Gly Val Tyr Glu Leu Lys Asp Glu Ser Leu Lys Asp Phe Asn
 820 825 830
 Met Tyr Phe Tyr His Tyr Ser Lys Thr Gln His Ser Lys Ala Glu His
 835 840 845
 Met Gln Lys Lys Arg Arg Lys Gln Glu Asn Lys Asp Glu Ala Leu Pro
 850 855 860
 Pro Pro Pro Pro Glu Phe Cys Pro Ala Phe Ser Lys Val Val Asn
 865 870 875 880
 Leu Leu Ser Cys Asp Val Met Ile Tyr Ile Leu Arg Thr Ile Phe Glu
 885 890 895
 Arg Ala Val Asp Thr Glu Ser Asn Leu Trp Thr Glu Gly Met Leu Gln
 900 905 910
 Met Ala Phe His Ile Leu Ala Leu Gly Leu Leu Glu Glu Lys Gln Gln
 915 920 925
 Leu Gln Lys Ala Pro Glu Glu Val Ala Phe Asp Phe Tyr His Lys
 930 935 940
 Ala Ser Arg Leu Gly Ser Ser Ala Met Asn Ala Gln Asn Ile Gln Met
 945 950 955 960
 Leu Leu Glu Arg Leu Lys Gly Ile Pro Gln Leu Glu Gly Gln Lys Asp
 965 970 975
 Met Ile Thr Trp Ile Leu Gln Met Phe Asp Thr Val Lys Arg Leu Arg
 980 985 990
 Glu Lys Ser Cys Leu Val Val Ala Thr Thr Ser Gly Leu Glu Cys Ile
 995 1000 1005

Lys Ser Glu Glu Ile Thr His Asp Lys Glu Lys Ala Glu Arg Lys Arg
 1010 1015 1020

Lys Ala Glu Ala Ala Arg Leu His Arg Gln Lys Ile Met Ala Gln Met
 1025 1030 1035 1040

Ser Ala Leu Gln Lys Asn Phe Ile Glu Thr His Lys Leu Met Tyr Asp
 1045 1050 1055

Asn Thr Ser Glu Val Thr Gly Lys Glu Asp Ser Ile Met Glu Glu Glu
 1060 1065 1070

Ser Thr Ser Ala Val Ser Glu Ala Ser Arg Ile Ala Leu Gly Pro Lys
 1075 1080 1085

Arg Gly Pro Ala Val Thr Glu Lys Glu Val Leu Thr Cys Ile Leu Cys
 1090 1095 1100

Gln Glu Glu Gln Glu Val Lys Leu Glu Asn Asn Ala Met Val Leu Ser
 1105 1110 1115 1120

Ala Cys Val Gln Lys Ser Thr Ala Leu Thr Gln His Arg Gly Lys Pro
 1125 1130 1135

Val Asp His Leu Gly Glu Thr Leu Asp Pro Leu Phe Met Asp Pro Asp
 1140 1145 1150

Leu Ala His Gly Thr Tyr Thr Gly Ser Cys Gly His Val Met His Ala
 1155 1160 1165

Val Cys Trp Gln Lys Tyr Phe Glu Ala Val Gln Leu Ser Ser Gln Gln
 1170 1175 1180

Arg Ile His Val Asp Leu Phe Asp Leu Glu Ser Gly Glu Tyr Leu Cys
 1185 1190 1195 1200

Pro Leu Cys Lys Ser Leu Cys Asn Thr Val Ile Pro Ile Ile Pro Leu
 1205 1210 1215

Gln Pro Gln Lys Ile Asn Ser Glu Asn Ala Glu Ala Leu Ala Gln Leu
 1220 1225 1230

Leu Thr Leu Ala Arg Trp Ile Gln Thr Val Leu Ala Arg Ile Ser Gly
 1235 1240 1245

Tyr Asn Ile Lys His Ala Lys Gly Glu Ala Pro Ala Val Pro Val Leu
 1250 1255 1260

Phe Asn Gln Gly Met Gly Asp Ser Thr Phe Glu Phe His Ser Ile Leu
 1265 1270 1275 1280

Ser Phe Gly Val Gln Ser Ser Val Lys Tyr Ser Asn Ser Ile Lys Glu
 1285 1290 1295

Met Val Ile Leu Phe Ala Thr Thr Ile Tyr Arg Ile Gly Leu Lys Val
 1300 1305 1310

Pro Pro Asp Glu Leu Asp Pro Arg Val Pro Met Met Thr Trp Ser Thr
 1315 1320 1325

Cys Ala Phe Thr Ile Gln Ala Ile Glu Asn Leu Leu Gly Asp Glu Gly
 1330 1335 1340

Lys Pro Leu Phe Gly Ala Leu Gln Asn Arg Gln His Ser Gly Leu Lys
 1345 1350 1355 1360
 Ala Leu Met Gln Phe Ala Val Ala Gln Arg Ala Thr Cys Pro Gln Val
 1365 1370 1375
 Leu Ile His Lys His Leu Ala Arg Leu Leu Ser Val Ile Leu Pro Asn
 1380 1385 1390
 Leu Gln Ser Glu Asn Thr Pro Gly Leu Leu Ser Val Asp Leu Phe His
 1395 1400 1405
 Val Leu Val Gly Ala Val Leu Ala Phe Pro Ser Leu Tyr Trp Asp Asp
 1410 1415 1420
 Thr Val Asp Leu Gln Pro Ser Pro Leu Ser Ser Tyr Asn His Leu
 1425 1430 1435 1440
 Tyr Leu Phe His Leu Ile Thr Met Ala His Met Leu Gln Ile Leu Leu
 1445 1450 1455
 Thr Thr Asp Thr Asp Leu Ser Pro Gly Pro Pro Leu Ala Glu Gly Glu
 1460 1465 1470
 Glu Asp Ser Glu Glu Ala Arg Cys Ala Ser Ala Phe Phe Val Glu Val
 1475 1480 1485
 Ser Gln His Thr Asp Gly Leu Thr Gly Cys Gly Ala Pro Gly Trp Tyr
 1490 1495 1500
 Leu Trp Leu Ser Leu Arg Asn Gly Ile Thr Pro Tyr Leu Arg Cys Ala
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 Ala Leu Leu Phe His Tyr Leu Leu Gly Val Ala Pro Pro Glu Glu Leu
 1525 1530 1535
 Phe Ala Asn Ser Ala Glu Gly Glu Phe Ser Ala Leu Cys Ser Tyr Leu
 1540 1545 1550
 Ser Leu Pro Thr Asn Leu Phe Leu Leu Phe Gln Glu Tyr Trp Asp Thr
 1555 1560 1565
 Ile Arg Pro Leu Leu Gln Arg Trp Cys Gly Asp Pro Ala Leu Leu Lys
 1570 1575 1580
 Ser Leu Lys Gln Lys Ser Ala Val Val Arg Tyr Pro Arg Lys Arg Asn
 1585 1590 1595 1600
 Ser Leu Ile Glu Leu Pro Glu Asp Tyr Ser Cys Leu Leu Asn Gln Ala
 1605 1610 1615
 Ser His Phe Arg Cys Pro Arg Ser Ala Asp Asp Glu Arg Lys His Pro
 1620 1625 1630
 Val Leu Cys Leu Phe Cys Gly Ala Ile Leu Cys Ser Gln Asn Ile Cys
 1635 1640 1645
 Cys Gln Glu Ile Val Asn Gly Glu Glu Val Gly Ala Cys Val Phe His
 1650 1655 1660
 Ala Leu His Cys Gly Ala Gly Val Cys Ile Phe Leu Lys Ile Arg Glu
 1665 1670 1675 1680

Cys Arg Val Val Leu Val Glu Gly Lys Ala Arg Gly Cys Ala Tyr Pro
1685 1690 1695

Ala Pro Tyr Leu Asp Glu Tyr Gly Glu Thr Asp Pro Gly Leu Lys Arg
1700 1705 1710

Gly Asn Pro Leu His Leu Ser Arg Glu Arg Tyr Arg Lys Leu His Leu
1715 1720 1725

Val Trp Gln Gln His Cys Ile Ile Glu Glu Ile Ala Arg Ser Gln Glu
1730 1735 1740

Thr Asn Gln Met Leu Phe Gly Phe Asn Trp Gln Leu Leu
1745 1750 1755

<210> 16

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: peptide

<400> 16

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<210> 17

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: peptide

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Gly Gly Gly Gly Tyr Gly Arg Lys Lys Arg Arg Gln Arg Arg Arg
1 5 10 15

<210> 18

<211> 5205

<212> DNA

<213> Homo sapiens

<400> 18

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catcatttgg cacaatttgtt gccagaaatt tactttgttg aaatggaccc agacttggaa 180
aagcaggagg aaagtgtaca aatgtcaata ttcactccac tggaaatggta cttatattgga 240
gaagatccag atatttgctt agagaaattt aagcacatgt gagcatttca gctttgtggg 300
agggtttca aaagtggaga gacaacctat tcttgcaggg attgtgcaat tgatccaaca 360
tgtgtactct gtatggactg cttccaggac agtgttcata aaaatcatcg ttacaagatg 420
catacttcta ctggaggagg gttctgtgac tgtggagaca cagaggcatg gaaaactggc 480

ccttttgtg taaatcatga accttggaga gcaggtacta taaaagagaa ttcacgctgt 540
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gtcgtagaaa tgactatatg ggaagaggaa aaagaactgc ctccctgaact ccagataagg 660
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Trp Trp Asp Gln Gln Val Asp Phe Tyr Thr Ala Phe Leu His His Leu
35 40 45

Ala Gln Leu Val Pro Glu Ile Tyr Phe Ala Glu Met Asp Pro Asp Leu
50 55 60

Glu Lys Gln Glu Glu Ser Val Gln Met Ser Ile Phe Thr Pro Leu Glu
65 70 75 80

Trp Tyr Leu Phe Gly Glu Asp Pro Asp Ile Cys Leu Glu Lys Leu Lys
85 90 95

His Ser Gly Ala Phe Gln Leu Cys Gly Arg Val Phe Lys Ser Gly Glu
100 105 110

Thr Thr Tyr Ser Cys Arg Asp Cys Ala Ile Asp Pro Thr Cys Val Leu
115 120 125

Cys Met Asp Cys Phe Gln Asp Ser Val His Lys Asn His Arg Tyr Lys
130 135 140

Met His Thr Ser Thr Gly Gly Gly Phe Cys Asp Cys Gly Asp Thr Glu
 145 150 155 160

Ala Trp Lys Thr Gly Pro Phe Cys Val Asn His Glu Pro Gly Arg Ala
 165 170 175

Gly Thr Ile Lys Glu Asn Ser Arg Cys Pro Leu Asn Glu Glu Val Ile
 180 185 190

Val Gln Ala Arg Lys Ile Phe Pro Ser Val Ile Lys Tyr Val Val Glu
 195 200 205

Met Thr Ile Trp Glu Glu Lys Glu Leu Pro Pro Glu Leu Gln Ile
 210 215 220

Arg Glu Lys Asn Glu Arg Tyr Tyr Cys Val Leu Phe Asn Asp Glu His
 225 230 235 240

His Ser Tyr Asp His Val Ile Tyr Ser Leu Gln Arg Ala Leu Asp Cys
 245 250 255

Glu Leu Ala Glu Ala Gln Leu His Thr Thr Ala Ile Asp Lys Glu Gly
 260 265 270

Arg Arg Ala Val Lys Ala Gly Ala Tyr Ala Ala Cys Gln Glu Ala Lys
 275 280 285

Glu Asp Ile Lys Ser His Ser Glu Asn Val Ser Gln His Pro Leu His
 290 295 300

Val Glu Val Leu His Ser Glu Ile Met Ala His Gln Lys Phe Ala Leu
 305 310 315 320

Arg Leu Gly Ser Trp Met Asn Lys Ile Met Ser Tyr Ser Ser Asp Phe
 325 330 335

Arg Gln Ile Phe Cys Gln Ala Cys Leu Arg Glu Glu Pro Asp Ser Glu
 340 345 350

Asn Pro Cys Leu Ile Ser Arg Leu Met Leu Trp Asp Ala Lys Leu Tyr
 355 360 365

Lys Gly Ala Arg Lys Ile Leu His Glu Leu Ile Phe Ser Ser Phe Phe
 370 375 380

Met Glu Met Glu Tyr Lys Lys Leu Phe Ala Met Glu Phe Val Lys Tyr
 385 390 395 400

Tyr Lys Gln Leu Gln Lys Glu Tyr Ile Ser Asp Asp His Asp Arg Ser
 405 410 415

Ile Ser Ile Thr Ala Leu Ser Val Gln Met Phe Thr Val Pro Thr Leu
 420 425 430

Ala Arg His Leu Ile Glu Glu Gln Asn Val Ile Ser Val Ile Thr Glu
 435 440 445

Thr Leu Leu Glu Val Leu Pro Glu Tyr Leu Asp Arg Asn Asn Lys Phe
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Asn Phe Gln Gly Tyr Ser Gln Asp Lys Leu Gly Arg Val Tyr Ala Val
 465 470 475 480

Ile Cys Asp Leu Lys Tyr Ile Leu Ile Ser Lys Pro Thr Ile Trp Thr
 485 490 495

Glu Arg Leu Arg Met Gln Phe Leu Glu Gly Phe Arg Ser Phe Leu Lys
 500 505 510

Ile Leu Thr Cys Met Gln Gly Met Glu Glu Ile Arg Arg Gln Val Gly
 515 520 525

Gln His Ile Glu Val Asp Pro Asp Trp Glu Ala Ala Ile Ala Ile Gln
 530 535 540

Met Gln Leu Lys Asn Ile Leu Leu Met Phe Gln Glu Trp Cys Ala Cys
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Asp Glu Glu Leu Leu Val Ala Tyr Lys Glu Cys His Lys Ala Val
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Met Arg Cys Ser Thr Ser Phe Ile Ser Ser Ser Lys Thr Val Val Gln
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Ser Cys Gly His Ser Leu Glu Thr Lys Ser Tyr Arg Val Ser Glu Asp
 595 600 605

Leu Val Ser Ile His Leu Pro Leu Ser Arg Thr Leu Ala Gly Leu His
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Val Arg Leu Ser Arg Leu Gly Ala Val Ser Arg Leu His Glu Phe Val
 625 630 635 640

Ser Phe Glu Asp Phe Gln Val Glu Val Leu Val Glu Tyr Pro Leu Arg
 645 650 655

Cys Leu Val Leu Val Ala Gln Val Val Ala Glu Met Trp Arg Arg Asn
 660 665 670

Gly Leu Ser Leu Ile Ser Gln Val Phe Tyr Tyr Gln Asp Val Lys Cys
 675 680 685

Arg Glu Glu Met Tyr Asp Lys Asp Ile Ile Met Leu Gln Ile Gly Ala
 690 695 700

Ser Leu Met Asp Pro Asn Lys Phe Leu Leu Leu Val Leu Gln Arg Tyr
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Glu Leu Ala Glu Ala Phe Asn Lys Thr Ile Ser Thr Lys Asp Gln Asp
 725 730 735

Leu Ile Lys Gln Tyr Asn Thr Leu Ile Glu Glu Met Leu Gln Val Leu
 740 745 750

Ile Tyr Ile Val Gly Glu Arg Tyr Val Pro Gly Val Gly Asn Val Thr
 755 760 765

Lys Glu Glu Val Thr Met Arg Glu Ile Ile His Leu Leu Cys Ile Glu
 770 775 780

Pro Met Pro His Ser Ala Ile Ala Lys Asn Leu Pro Glu Asn Glu Asn
 785 790 795 800

Asn Glu Thr Gly Leu Glu Asn Val Ile Asn Lys Val Ala Thr Phe Lys
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Lys Pro Gly Val Ser Gly His Gly Val Tyr Glu Leu Lys Asp Glu Ser
 820 825 830

Leu Lys Asp Phe Asn Met Tyr Phe Tyr His Tyr Ser Lys Thr Gln His
 835 840 845

Ser Lys Ala Glu His Met Gln Lys Lys Arg Arg Lys Gln Glu Asn Lys
 850 855 860

Asp Glu Ala Leu Pro Pro Pro Pro Pro Glu Phe Cys Pro Ala Phe
 865 870 875 880

Ser Lys Val Ile Asn Leu Leu Asn Cys Asp Ile Met Met Tyr Ile Leu
 885 890 895

Arg Thr Val Phe Glu Arg Ala Ile Asp Thr Asp Ser Asn Leu Trp Thr
 900 905 910

Glu Gly Met Leu Gln Met Ala Phe His Ile Leu Ala Leu Gly Leu Leu
 915 920 925

Glu Glu Lys Gln Gln Leu Gln Lys Ala Pro Glu Glu Glu Val Thr Phe
 930 935 940

Asp Phe Tyr His Lys Ala Ser Arg Leu Gly Ser Ser Ala Met Asn Ile
 945 950 955 960

Gln Met Leu Leu Glu Lys Leu Lys Gly Ile Pro Gln Leu Glu Gly Gln
 965 970 975

Lys Asp Met Ile Thr Trp Ile Leu Gln Met Phe Asp Thr Val Lys Arg
 980 985 990

Leu Arg Glu Lys Ser Cys Leu Ile Val Ala Thr Thr Ser Gly Ser Glu
 995 1000 1005

Ser Ile Lys Asn Asp Glu Ile Thr His Asp Lys Glu Lys Ala Glu Arg
 1010 1015 1020

Lys Arg Lys Ala Glu Ala Ala Arg Leu His Arg Gln Lys Ile Met Ala
 1025 1030 1035 1040

Gln Met Ser Ala Leu Gln Lys Asn Phe Ile Glu Thr His Lys Leu Met
 1045 1050 1055

Tyr Asp Asn Thr Ser Glu Met Pro Gly Lys Glu Asp Ser Ile Met Glu
 1060 1065 1070

Glu Glu Ser Thr Pro Ala Val Ser Asp Tyr Ser Arg Ile Ala Leu Gly
 1075 1080 1085

Pro Lys Arg Gly Pro Ser Val Thr Glu Lys Glu Val Leu Thr Cys Ile
 1090 1095 1100

Leu Cys Gln Glu Glu Gln Glu Val Lys Ile Glu Asn Asn Ala Met Val
 1105 1110 1115 1120

Leu Ser Ala Cys Val Gln Lys Ser Thr Ala Leu Thr Gln His Arg Gly
 1125 1130 1135

Lys Pro Ile Glu Leu Ser Gly Glu Ala Leu Asp Pro Leu Phe Met Asp
 1140 1145 1150

Pro Asp Leu Ala Tyr Gly Thr Tyr Thr Gly Ser Cys Gly His Val Met
 1155 1160 1165
 His Ala Val Cys Trp Gln Lys Tyr Phe Glu Ala Val Gln Leu Ser Ser
 1170 1175 1180
 Gln Gln Arg Ile His Val Asp Leu Phe Asp Leu Glu Ser Gly Glu Tyr
 1185 1190 1195 1200
 Leu Cys Pro Leu Cys Lys Ser Leu Cys Asn Thr Val Ile Pro Ile Ile
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 Pro Leu Gln Pro Gln Lys Ile Asn Ser Glu Asn Ala Asp Ala Leu Ala
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 Gln Leu Leu Thr Leu Ala Arg Trp Ile Gln Thr Val Leu Ala Arg Ile
 1235 1240 1245
 Ser Gly Tyr Asn Ile Arg His Ala Lys Gly Glu Asn Pro Ile Pro Ile
 1250 1255 1260
 Phe Phe Asn Gln Gly Met Gly Asp Ser Thr Leu Glu Phe His Ser Ile
 1265 1270 1275 1280
 Leu Ser Phe Gly Val Glu Ser Ser Ile Lys Tyr Ser Asn Ser Ile Lys
 1285 1290 1295
 Glu Met Val Ile Leu Phe Ala Thr Thr Ile Tyr Arg Ile Gly Leu Lys
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 Val Pro Pro Asp Glu Arg Asp Pro Arg Val Pro Met Leu Thr Trp Ser
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 Thr Cys Ala Phe Thr Ile Gln Ala Ile Glu Asn Leu Leu Gly Asp Glu
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 Gly Lys Pro Leu Phe Gly Ala Leu Gln Asn Arg Gln His Asn Gly Leu
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 Lys Ala Leu Met Gln Phe Ala Val Ala Gln Arg Ile Thr Cys Pro Gln
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 Asn Ile Lys Ser Glu Asp Thr Pro Cys Leu Leu Ser Ile Asp Leu Phe
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 Gln Lys Asn Thr Val Val Arg Tyr Pro Arg Lys Arg Asn Ser Leu Ile
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 Glu Leu Pro Asp Asp Tyr Ser Cys Leu Leu Asn Gln Ala Ser His Phe
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 Arg Cys Pro Arg Ser Ala Asp Asp Glu Arg Lys His Pro Val Leu Cys
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 Ile Val Asn Gly Glu Glu Val Gly Ala Cys Ile Phe His Ala Leu His
 1650 1655 1660
 Cys Lys Ala Arg Gly Cys Ala Tyr Pro Ala Pro Tyr Leu Asp Glu Tyr
 1665 1670 1675 1680
 Gly Glu Thr Asp Pro Gly Leu Lys Arg Gly Asn Pro Leu His Leu Ser
 1685 1690 1695
 Arg Glu Arg Tyr Arg Lys Leu His Leu Val Trp Gln Gln His Cys Ile
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 Ile Glu Glu Ile Ala Arg Ser Gln Glu Thr Asn Gln Met Leu Phe Gly
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 Phe Asn Trp Gln Leu Leu *
 1730 1735

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 <213> Artificial Sequence

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 <223> Description of Artificial Sequence: PCR Primer

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22

<210> 21
 <211> 20

<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: PCR Primer

<400> 21
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<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: PCR Primer

<400> 22
aggaagctgt ggtcatgt 18

<210> 23
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<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: PCR Primer

<400> 23
gttaggaaga actg 14

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<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: PCR Primer

<400> 24
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<210> 25
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<212> DNA
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<220>
<223> Description of Artificial Sequence: PCR Primer

<400> 25
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<220>
<223> Description of Artificial Sequence: PCR Primer

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<210> 28
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<212> DNA
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<220>
<223> Description of Artificial Sequence: PCR Primer

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<210> 29
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<220>
<223> Description of Artificial Sequence: PCR Primer

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